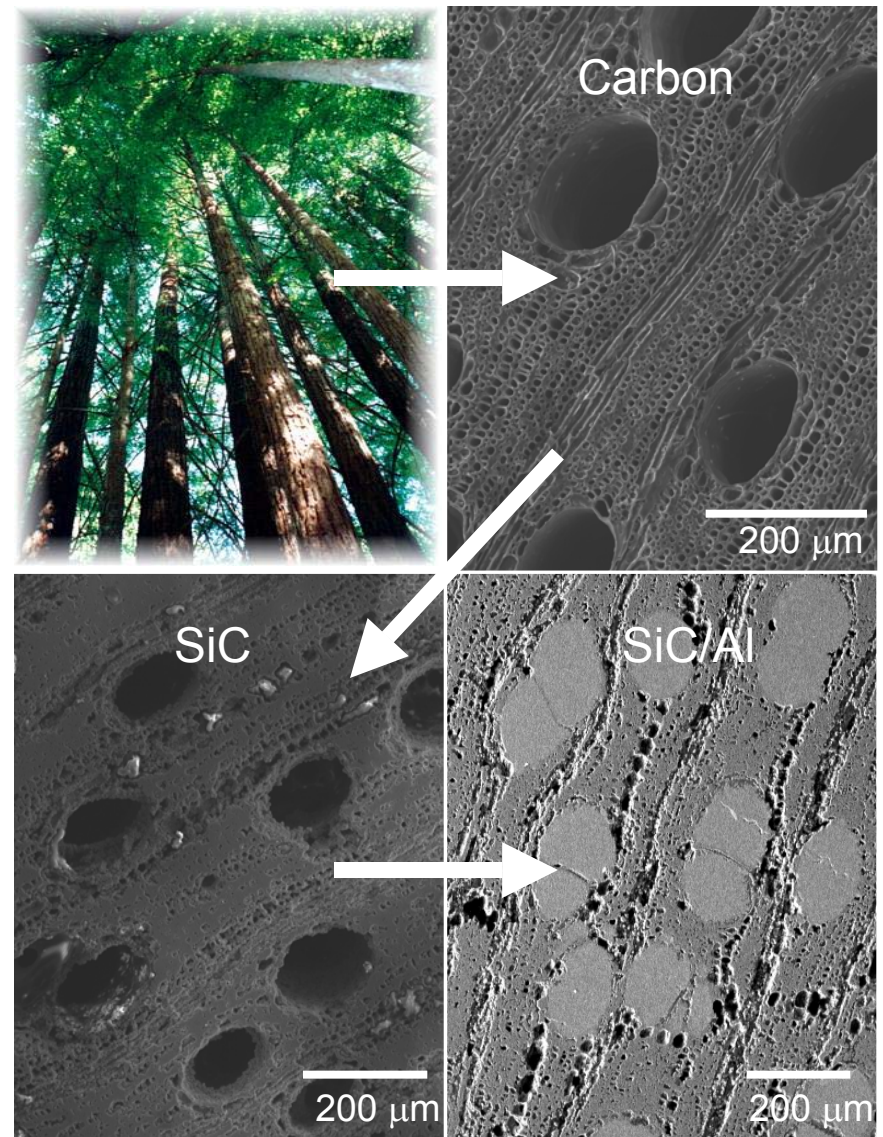


# SiC-Based Ceramics from Naturally-Derived Scaffolds

K. T. Faber, P.I., Northwestern University, DMR-0244258

Nature has provided some outstanding examples of complex, but effective material design for mechanical robustness, such as wood. This can be replicated in synthetic materials using wood as a template. "Biomorphic" silicon carbide can be produced through the controlled pyrolysis of wood to provide a carbon scaffold (upper right) for infiltration by liquid silicon. The silicon reacts with the carbon to form silicon carbide (lower left). The resulting microstructures are sophisticated cellular structures with unique mechanical properties with high temperature capabilities ( $>1300^{\circ}\text{C}$ ) for filters and catalyst supports. SiC/Al composites can be fabricated by re-infiltration of the SiC with molten aluminum (lower right).

This work is performed in conjunction with the University of Seville and the Polytechnic University of Madrid.



# SiC-Based Ceramics from Naturally-Derived Scaffolds

## Outreach: Teaching Module on Cellular Materials

K. T. Faber, P.I., Northwestern University, DMR-0244258

In collaboration with a high school teacher supported by the NSF Research Experience for Science Teachers Program, a teaching module on natural and synthetic cellular materials was developed.

Students first explore the microstructures of some natural cellular materials such as cork, wood, pumice, and scoria, and compare them to synthetic polymer foams. Then, using a simple laboratory set-up to apply load and measure deflections, a classic compressive stress-strain curve of cellular materials is measured. The curves at right demonstrate the initial elastic region, the plateau region of cell collapse, and the final region of material densification. Students learn the principles of elasticity and non-linear elastic deformation from these experiments.

